US009636453B2

(12) **United States Patent**
Monirabbasi et al.

(10) **Patent No.: US 9,636,453 B2**
(45) **Date of Patent: May 2, 2017**

(54) **ADVANCE DIAGNOSIS OF INFUSION DEVICE OPERATING MODE VIABILITY**

(71) Applicant: **MEDTRONIC MINIMED, INC.,** Northridge, CA (US)

(72) Inventors: **Salman Monirabbasi**, Playa Vista, CA (US); **Louis J. Lintereur**, Stevenson Ranch, CA (US); **Jin Yan**, Chatsworth, CA (US)

(73) Assignee: **Medtronic MiniMed, Inc.**, Northridge, CA (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/561,128**

(22) Filed: **Dec. 4, 2014**

(65) **Prior Publication Data**

US 2016/0158438 A1 Jun. 9, 2016

(51) **Int. Cl.**
| | |
|---|---|
| *A61M 1/00* | (2006.01) |
| *A61M 31/00* | (2006.01) |
| *A61M 5/168* | (2006.01) |
| *A61M 5/172* | (2006.01) |
| *G06F 19/00* | (2011.01) |

(52) **U.S. Cl.**
CPC ...... *A61M 5/16804* (2013.01); *A61M 5/1723* (2013.01); *G06F 19/3468* (2013.01)

(58) **Field of Classification Search**
CPC .... A61M 2005/14208; A61M 5/16804; A61M 5/16831; A61M 5/16836; A61M 5/1723; A61M 5/1684; G06F 19/3468
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 3,631,847 | A | 1/1972 | Hobbs, II |
| 4,212,738 | A | 7/1980 | Henne |
| 4,270,532 | A | 6/1981 | Franetzki et al. |

(Continued)

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| DE | 4329229 | 3/1995 |
| EP | 0319268 | 11/1988 |

(Continued)

OTHER PUBLICATIONS

PCT Search Report (PCT/US02/03299), Oct. 31, 2002, Medtronic Minimed, Inc.

(Continued)

*Primary Examiner* — Rebecca E Eisenberg
(74) *Attorney, Agent, or Firm* — Lorenz & Kopf, LLP

(57) **ABSTRACT**

Infusion systems, infusion devices, and related operating methods are provided. An exemplary method of operating an infusion device to deliver fluid to a user in accordance with an operating mode involves obtaining operational information pertaining to one or more prior instances of the operating mode, obtaining status information pertaining to the infusion device, and determining a diagnosis time based at least in part on the operational information. The diagnosis time is prior to a subsequent instance of the operating mode. At the diagnosis time, the method automatically determines the viability of the subsequent instance of the operating mode based at least in part on the status information and automatically generates a notification indicative of a recommended action for the user based at least in part on the viability.

15 Claims, 10 Drawing Sheets